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October 31, 2017

Via ECFS

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Restoring Internet Freedom, WC Docket No. 17-108

Dear Ms. Dortch:

On behalf of AT&T, we write in response to the economic analysis by Dr. David Evans that INCOMPAS attached to its reply comments. Dr. Evans purports to make two central findings—that fixed broadband Internet access providers (1) “exercise significant market power” and (2) have the “incentive and ability” through interconnection arrangements “to harm edge providers that compete with their linear programming businesses.” Evans Report at 1. Those claims are meritless for the reasons that AT&T has detailed in its comments and reply comments. The attached report by Drs. Mark Israel and Bryan Keating further demonstrates that Dr. Evans’ claims are “flawed, incomplete, [and] incorrect as a matter of economics and marketplace facts.” Israel-Keating Report at 2.

As Drs. Israel and Keating explain, Dr. Evans’ “market power” analysis is flawed in several independent respects. First, it is based on a *backwards-looking* marketplace assessment that ignores ongoing changes in the broadband Internet access marketplace, for which the Commission should account in designing forward-looking rules. Israel-Keating Report at 3-15. Dr. Evans does not—and cannot—dispute that mobile broadband is intensely competitive, nor does he dispute that mobile services are poised to match or exceed the capabilities of fixed broadband services. Indeed, even before commercial implementation of 5G technology, the densification of wireless networks through small cell deployments will dramatically increase mobile broadband speeds. Yet his backwards-looking analysis completely ignores the impact of these changes in the marketplace. Beyond that, Dr. Evans’ analysis is flawed because his “market power” findings rest on (i) inappropriately excluding commercially significant broadband offerings; (ii) overstating switching costs while misunderstanding the economic implications of “win-back” practices; and (iii) disregarding the industry-specific conditions that facilitate competitive outcomes with as few as two competitors. *Id.* at 15-25.

As Drs. Israel and Keating further explain, there is also no merit to Dr. Evans' claim that fixed broadband providers have the ability and incentive to harm edge providers through interconnection arrangements. *Id.* at 25-47. First, Dr. Evans' implicit premise—that interconnection fees by themselves demonstrate market power—is incorrect. To the contrary, interconnection fees simply reflect the dynamics of a double-sided market, exert downward pressure on consumer prices, and give edge providers efficient incentives to control the costs they impose on Internet access networks. In all events, Dr. Evans makes no effort to substantiate his “raising rivals’ cost” theory of harm even though the information to do so is available to INCOMPAS and its members, presumably because any attempt to do so would be implausible. The interconnection fees at issue are competitively trivial and thus cannot be used as a mechanism to harm competition. Further, commercial and technological realities would undermine any effort by Internet service providers to harm edge providers through interconnection.

This letter and attachment are being filed electronically in accordance with Section 1.1206 of the Commission's rules. Please contact me if you have any questions.

Sincerely,

/s/ Jonathan E. Nuechterlein
Jonathan E. Nuechterlein
Counsel to AT&T

cc: Kris Monteith
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Economic Analysis of Dr. Evans' Claims as They Relate to *Restoring Internet Freedom*

**Mark Israel
Bryan Keating***

October 31, 2017

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I. INTRODUCTION AND OVERVIEW

1. Dr. David Evans has authored a white paper on behalf of INCOMPAS titled “Economic Findings Concerning the State of Competition for Wired Broadband Provision to U.S. Households and Edge Providers.”² Relying primarily on his characterization of past statements from the Federal Communications Commission (FCC) and the U.S. Department of Justice (DOJ) regarding merger and regulatory matters, Dr. Evans claims to identify two market failures that affect the provision of broadband services in the United States:³

- First, Dr. Evans claims “that large wired broadband providers are bottlenecks between edge providers and households and therefore able to exercise significant market power over edge providers by restricting access to households.”
- Second, he alleges that a market failure “results from the fact that the large wired broadband providers also own large linear programming providers.”

Dr. Evans further asserts, “[t]he FCC and Justice Department findings are relevant for considering public policy towards the provision of wired broadband services to households and edge providers.”⁴

2. We have been asked by counsel for AT&T to review and comment on Dr. Evans’ analysis. In this paper, we present the results of that review.

3. Contrary to his assertion, Dr. Evans’ reliance on analyses and conclusions from previous cases renders his paper largely *irrelevant* for current public policy for at least two main reasons. First, many of the findings he relies on do not withstand economic scrutiny. Second, even assuming some of those findings may have been economically valid when first made, the fact that they come from prior regulatory proceedings introduces a systemic flaw in Dr. Evans’ analysis. While the evidence Dr. Evans cites may appear to be relatively recent, it

² David S. Evans, “Economic Findings Concerning the State of Competition for Wired Broadband Provision to U.S. Households and Edge Providers,” Exhibit B to Reply Comments of INCOMPAS, *In the Matter of Restoring Internet Freedom*, WC Docket No. 17-108, August 30, 2017 (hereinafter, *Evans White Paper*).

³ *Evans White Paper*, p. 1.

⁴ *Evans White Paper*, p. 1.

is actually quite old in “Internet-time,” particularly given the rapid and regular appearance of disruptive Internet technologies and services. In light of these disruptions, forward-looking analyses—which both account for current marketplace realities and make well-reasoned predictive judgments about likely changes to those realities—are required to design a regulatory framework that recognizes and encourages new and expanding sources of competition in the provision of broadband Internet access. Dr. Evans’ backward-looking analysis fails to meet this standard. More generally, it is incomplete, incorrect as a matter of economics and marketplace facts, and largely irrelevant to a forward-looking competitive assessment of wired broadband services.

4. In particular, we find:

- *Dr. Evans’ analysis of broadband market power is incomplete and flawed.* By looking backward to statements in previous cases, Dr. Evans substantially understates the real competitive threat posed by mobile broadband providers, as mobile data speeds and capacities increase and distinctions between wired and wireless Internet access collapse. Notably, Dr. Evans does not dispute that mobile broadband is competitive. However, he fails to recognize the implications of this mobile broadband competition for any alleged market power otherwise held by fixed broadband Internet access providers. Even to the extent that next generation mobile wireless offerings are not fully substitutable for fixed broadband products today, broadband Internet access providers make current decisions with the knowledge that attempts to harm consumers or edge providers would hasten the emergence of these alternatives. Furthermore, in assessing competition in fixed broadband Internet access, Dr. Evans: (i) inappropriately excludes from the market Internet access options with download speeds under 25 Mbps based on no reliable economic analysis; (ii) overstates the impact of consumer switching and search costs on competition; and (iii) improperly dismisses arguments that two providers may be sufficient to create competitive outcomes given the characteristics of the industry. (See Section II.)
- *Dr. Evans’ analysis of broadband Internet access providers’ incentives and ability to harm edge providers is incomplete and flawed.* Dr. Evans points to the

interconnection fees that broadband Internet access providers charge edge providers, but he ignores the most relevant fact about these fees: that they are competitively insignificant by any relevant measure. His attempt to infer market power from the simple fact that such fees exist is unsupported as a matter of economics. Rather, to the extent that interconnection results in fees on the edge provider side of the market, those fees likely serve efficiently to shift payments away from end consumers and toward edge providers who have greater ability to control the costs they impose on Internet access networks. In addition, Dr. Evans substantially understates the costs and overstates the benefits to broadband Internet access providers of trying to harm edge providers, rendering his conclusions on incentives to do so invalid. (See Section III.)

5. The remainder of this paper explains these conclusions in greater depth and provides details of the facts and analysis that led us to reach them.

II. DR. EVANS' ANALYSIS OF BROADBAND MARKET POWER IS INCOMPLETE AND FLAWED

6. Dr. Evans asserts that “high-speed wired [broadband Internet access service] providers” do not face effective competition in the provision of Internet services to households and that most households have only two such providers to choose from.⁵ He further asserts that switching costs reduce competitive pressures on high-speed fixed broadband providers,⁶ and that neither slower fixed broadband providers nor alternative technologies, such as mobile broadband, constrain the behavior of fixed broadband providers.⁷ He concludes that, under these conditions, high-speed fixed broadband providers are a bottleneck between edge providers and households and thus have significant market power with respect to edge providers as well as consumers.⁸

⁵ *Evans White Paper*, pp. 11, 20.

⁶ *Evans White Paper*, pp. 11-12.

⁷ *Evans White Paper*, pp. 12-17.

⁸ *Evans White Paper*, p. 63.

7. As we explain in this section, Dr. Evans’ claims about broadband provider market power do not properly account for current marketplace realities and thus do not hold up to scrutiny. Dr. Evans conducts his analysis in a “market” that ignores important competitive threats from mobile providers (Section II.A) and artificially includes only fixed broadband services above an arbitrary speed threshold (Section II.B). In addition, Dr. Evans overstates the impact of switching and search costs as impediments to competition, in part because he does not recognize that aggressive efforts to retain customers demonstrate that providers take the threat of switching seriously (Section II.C). Finally, Dr. Evans incorrectly concludes that a market cannot be competitive if there are only two providers (Section II.D).

A. DR. EVANS’ ANALYSIS INCORRECTLY DISCOUNTS COMPETITION FROM MOBILE TECHNOLOGIES

8. Although Dr. Evans and INCOMPAS do not claim that mobile broadband is noncompetitive, they dismiss the significance of competition between mobile and fixed broadband by focusing on the service constraints (e.g., speed limitations) that mobile networks face today.⁹ These constraints are rapidly eroding, however, and, as the constraints erode, so do the boundaries between mobile and fixed broadband. Fixed broadband providers already consider wireless competition and technologies when making their strategic decisions. Over the course of the next few years, as small cell deployments and 5G networks transform mobile broadband service even further, the boundaries between fixed and mobile Internet access will erode further, and the competitive mobile broadband industry will become an even more powerful constraint on fixed broadband providers.

⁹ *Evans White Paper*, pp. 14-17.

1. Mobile broadband is indisputably competitive

9. As the Commission concluded in its most recent Mobile Wireless Competition Report, “there is effective competition in the mobile wireless services marketplace.”¹⁰ The Commission identifies several facts that support this conclusion:¹¹

- Rising consumer demand and increased output;
- Falling prices (on both a per-connection and per-MB basis);
- Ongoing and substantial network investment;
- Enhanced service quality and network speed;
- Expanded access to spectrum, a crucial input into the provision of wireless data services; and
- Ongoing competition to develop and implement new technologies.

10. The evidence that the Commission cites in its Mobile Wireless Competition Report documents robust competition among mobile providers. The Commission’s findings are consistent with those in a declaration submitted in the Commission’s *Restoring Internet Freedom* docket, co-authored by Dr. Israel.¹² Dr. Evans does not dispute the competitive nature of the mobile marketplace.

2. Mobile broadband is increasingly competing with fixed broadband

11. The increasing competition between mobile and fixed broadband networks, which we detail below, has at least three implications that undermine the value of the backward-looking analyses employed by Dr. Evans. First, this convergence is real and affects competition today

¹⁰ Federal Communications Commission, Twentieth Mobile Wireless Competition Report, *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 17-69 (hereinafter, *20th Mobile Competition Report*), ¶ 2.

¹¹ *20th Mobile Competition Report*, ¶¶ 5-10.

¹² Declaration of Mark A. Israel, Allan L. Shampine, and Thomas A. Stemwedel, Attachment to Comments of AT&T Services, Inc., *In the Matter of Restoring Internet Freedom*, WC Docket 17-108, July 17, 2017.

in a way that data and other evidence from as recent as 2015 (the most recent that Dr. Evans considers) could not have reflected. Second, a durable regulatory framework needs to be built in a way that reflects the fact that convergence will continue and, indeed, accelerate, something that may have seemed far less certain even two years ago when mobile networks' speed and capacities were below what they are today. Third, one cannot understand the real-world constraints that underlie strategic decisions by Internet access providers today—such as the decision by cable providers to pursue mobile Internet access capabilities aggressively and by AT&T to use G.fast technology to offer fixed broadband services to apartments and condominiums outside of its traditional broadband Internet access footprint—without recognizing that those providers know that decisions they make today determine their competitive position in a converged world for years to come.

12. The convergence of mobile and fixed broadband increases the number of options available to customers (who might previously have looked only at mobile options or only at fixed options), thus further increasing the intensity of broadband competition. A recent example of such convergence effects comes from the closely related experience of voice services. Recall that there was once real debate about whether mobile voice services would ever compete directly with landline voice service, which sounds almost comical now. Mobile voice services not only compete with landline voice services, they have become the dominant form of voice connectivity. As of December 2016, the Centers for Disease Control (“CDC”) reports that more than half of U.S. households (50.8 percent of households, representing 50.5 percent of adults) have only wireless voice connections at home, and that another 15 percent of households (16.7 percent of adults) have a landline phone but conduct essentially all of their calls on wireless.¹³ In total, two thirds of U.S. households do not primarily use landline phones for voice service, more than double the fraction of such households in 2008.¹⁴

¹³ National Center for Health Statistics, “Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, July–December 2016,” May 2017, p. 4 and Tables 1 and 5, *available at* <https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201705.pdf>. The CDC began tracking “wireless-mostly” households in 2007.

¹⁴ National Center for Health Statistics, “Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, January – June 2008,” December 2008, pp. 2-3 and Tables 1 and 3, *available at*

Wireless voice service does not just compete with wireline voice service, but rather has largely supplanted it. This outcome is not surprising given that a wireless connection can be used both at home and elsewhere and requires substantially lower installation costs than does landline. A wireless number also ports with the consumer when she moves residences, providing additional convenience.

13. The same process of convergence is occurring with respect to data services. The Pew Research Center estimates that about 12 percent of adults in 2016 obtained Internet service at home solely through their smart phones.¹⁵ Similarly, a recent survey by Morgan Stanley finds that between 10 and 20 percent of wired broadband users are “quite likely” or “very likely” to switch to wireless broadband usage in the next six months.¹⁶

14. One reason usage of mobile data service is growing is that the quality of mobile broadband service has improved along multiple dimensions, including consistency of service, throughput, and coverage.¹⁷ For example, mobile data service now has throughput metrics

<https://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200812.pdf>. In 2008, 17.5 percent of households were wireless-only and 13.3 percent were wireless-mostly.

¹⁵ Pew Research Center, “Internet/Broadband Fact Sheet,” January 12, 2017, *available at* <http://www.pewinternet.org/fact-sheet/internet-broadband>; Pew Research Center, “Mobile Fact Sheet,” January 12, 2017, *available at* <http://www.pewinternet.org/fact-sheet/mobile/>. The share of adults using only wireless broadband at home is higher for younger generations. The Pew Research Center estimates that 17 percent of 18-29 year olds obtained Internet access at home strictly through their smart phones (i.e., did not use a landline broadband connection at home at all). Even among 65+ year olds, seven percent did so.

¹⁶ Morgan Stanley, “5th Annual Broadband Survey – Unbundling Accelerating,” October 17, 2017, p. 40 (Q: “In next 6 months, how likely are you to cancel broadband and shift to mobile-only internet usage?”).

¹⁷ Satellite broadband services are also improving. Last year, ViaSat refocused its existing satellite service and now offers 25 Mbps download speeds in 22 states. Additionally, ViaSat has launched a satellite (ViaSat-2) with twice the capacity of its existing satellite that is expected to be operational beginning in early 2018. It plans to launch a third satellite in 2019 or 2020 with over three times the capacity of ViaSat-2. HughesNet launched a new satellite in December 2016, and introduced 25/3 service in the U.S. in the first quarter of 2017. (See 2016 ViaSat Annual Report, p. 6; BroadbandNow, “Exede Internet,” October 20, 2017, *available at* <https://broadbandnow.com/Exede-Internet> (listing 22 states in which ViaSat’s Exede service is available with a “Max Speed” of 25 Mbps); Alex Miller, “Status Update for

similar to commonly used fixed broadband services.¹⁸ Moreover, while multiple users in the same household often share a fixed connection, mobile connections are typically measured on a per-device basis; this means that, while two or more smart phone users in a household may each take advantage of 25 Mbps connections on their phones, those users would likely be sharing a fixed connection in the home that may be 25 Mbps (or less).

15. Mobile broadband is catching up with fixed broadband in other respects as well. There have been significant changes in how providers price mobile services. While the Commission has previously noted that mobile broadband service may have data allowances that are more restrictive than on fixed connections,¹⁹ mobile plans offering unlimited data are widely available today.²⁰

ViaSat-2, Our Newest Satellite,” Exede by ViaSat, August 23, 2017, *available at* <https://www.exede.com/blog/status-update-viasat-2-newest-satellite/>; Peter B. de Selding, “ViaSat details \$1.4-billion global Ka-band satellite broadband strategy to oust incumbent players,” *Space News*, February 10, 2016; and EchoStar Q1 2017 Earnings Call, May 10, 2017.)

¹⁸ Compare, for example, Tom’s Guide, “The Fastest Wireless Network of 2017,” March 28, 2017 *available at* <https://www.tomsguide.com/us/best-mobile-network,review-2942.html>, (reporting speed test results of 36.0 Mbps for Verizon, 23.5 Mbps for T-Mobile, 25.6 Mbps for AT&T and 17.7 Mbps for Sprint), with Federal Communications Commission, “2016 Measuring Broadband America – Fixed Broadband Report,” December 1, 2016, *available at* <https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-report-2016>, Chart 3 (showing median speed of 32 Mbps in 2014 and 41 Mbps in 2015).

¹⁹ 2016 Broadband Progress Report, *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 15-191, FCC 16-6, rel. January 29, 2016 (hereinafter, *2016 Broadband Progress Report*), ¶ 41 (“Consumers that are dependent solely on mobile broadband are significantly more likely to exceed their monthly data allowances, causing them to incur additional fees or forego use of the Internet. And, as several commenters note, mobile broadband networks lack the capacity or consistency of service to support most bandwidth intensive uses such as full-screen HD video streaming, online gaming, and video conferencing applications including telehealth and education platforms.”).

²⁰ *20th Mobile Competition Report*, ¶ 51.

16. Dr. Evans points out that many of these unlimited plans the potential for throughput reductions at usage above 22 GB per month.²¹ In contrast, he observes that the *average* household consumes 57 GB of data per month.²² There are several problems with Dr. Evans' analysis. First, mobile broadband Internet access providers typically apply such restrictions on a *per-device* basis. For example, under AT&T's unlimited plan, a family of four, each with his or her own device, can access collectively 88 GB of data without being subjected to potential speed reductions.²³ Moreover, it is our understanding that even those customers who exceed 22 GB of usage on a single device in a month rarely experience a noticeable speed reduction because AT&T does not automatically reduce their download speeds, but rather deprioritizes their packets only where and for as long as they are using their devices in an area experiencing congestion. Actual speed reductions are rare, generally minimal, and short-lived.²⁴

17. Second, a firm's pricing and other strategic decisions depend on competition at the margin. Dr. Evans provides no evidence that households at the margin of deciding whether to

²¹ *Evans White Paper*, p. 15.

²² *Evans White Paper*, pp. 15-16.

²³ Comments of AT&T Services Inc., *In the Matter of Restoring Internet Freedom*, WC Docket No. 17-108, July 17, 2017, note 42 ("Most mobile providers that offer unlimited plans set a threshold after which an unlimited customer may very occasionally be subject to slower speeds. In AT&T's case, that threshold is set at 22 GB *per line* per billing cycle. But even the customers who exceed that high per-line threshold during a billing cycle are subject to slower speeds only during periods of network congestion, and in general such periods are unusual and brief.").

²⁴ *Id.*

Dr. Evans also notes that some mobile providers offering unlimited plans impose usage allowances for "tethering"—*i.e.*, the use of a device as a mobile hotspot. *Evans White Paper*, p. 15. These tethering allowances are also generally applied on a per-device (rather than per-household) basis and are not implicated when consumers watch video on the devices themselves (phones or tablets) or otherwise use their mobile connections to watch video without converting the devices into mobile hotspots (e.g., through "mirroring"). See, e.g., Vaughn Highfield, "How to Use Chromecast Without Wi-Fi: Making the Most of Google Streamer When Traveling," Alphr (May 11, 2017), *available at* <http://www.alphr.com/google/google-chromecast/1002449/how-to-use-chromecast-without-wi-fi-making-the-most-of-google-s>.

switch from fixed to mobile broadband services consume anything close to 57 GB of data per month. Indeed, the data source that he cites for the mean usage of 57 GB per month also shows that median usage was 22.5 GB per month, which means that nearly half of households have usage at or below the threshold for potential speed reductions even in a one-device household (and many more households would be below the threshold if they have multiple devices).²⁵ Recent literature also demonstrates that data usage per household varies widely, with the lower tail of the usage distribution falling well below current mobile thresholds for potential speed reductions.²⁶

18. As mobile services improve in quality, consumers increasingly view those services as substitutes for fixed services, and that trend will continue. Mobile services already are widely used for streaming video, just as fixed services are. Approximately half of all data traffic on mobile networks today consists of streaming video, and that fraction is expected to rapidly increase in the future.²⁷ Usage of mobile data itself has exploded, increasing over 3,400 percent between 2010 and 2016.²⁸ As Cisco has noted, “[t]his situation is encouraging mobile broadband substitution for fixed broadband.”²⁹

²⁵ Sandvine, “Global Internet Phenomena Report, 2H 2014,” *available at*: <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/2h-2014-global-internet-phenomena-report.pdf>, p. 5.

²⁶ See, e.g., Jacob B. Malone, Aviv Nevo, and Jonathan W. Williams, “The Tragedy of the Last Mile: Economic Solutions to Congestion in Broadband Networks,” NET Institute Working Paper No. 16-20, June 6, 2017, Table 1, showing that the 25th percentile household consumes approximately three GB of data in the sample, which is based on a North American fixed broadband Internet access provider in 2015.

²⁷ See, for example, Cisco, “Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020,” *available at* https://www.cisco.com/c/dam/m/en_in/innovation/enterprise/assets/mobile-white-paper-c11-520862.pdf.

²⁸ CTIA, “Annual Year-End 2016 Top-Line Survey Results,” p. 3, *available at* <https://www.ctia.org/docs/default-source/default-document-library/annual-year-end-2016-top-line-survey-results-final.pdf?sfvrsn=2>.

²⁹ Cisco, “Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020,” p. 28, *available at* https://www.cisco.com/c/dam/m/en_in/innovation/enterprise/assets/mobile-white-paper-c11-520862.pdf.

19. Industry analyst Piper Jaffray Co. has observed that the increasing usage of unlimited data plans coincides with the increase in over-the-top (“OTT”) video options.³⁰

The removal of data constraints could not come at a better time, in our view, with rapidly evolving OTT offerings. We found that with an update to unlimited data, 35% of consumers expect to increase their long-form video consumption We expect this pace of growth to continue as carriers remove data constraints and subscribers utilize new OTT and premium streaming music services in a truly ‘entertainment everywhere’ environment.

In fact, T-Mobile now bundles a Netflix subscription with many of its wireless offerings.³¹

20. In sum, although Dr. Evans defines “fixed broadband” as a standalone product market, that market definition is unstable, does not reflect current marketplace realities, and does not provide a sound basis for forward-looking regulation. And the increasing competition between fixed and wireless broadband, which is already undermining Dr. Evans’ market definition, will accelerate in the future. Even before mobile broadband providers commercially deploy 5G mobile broadband service, they will be able to offer dramatic speed increases on their already ubiquitous LTE networks as a result of densification efforts in preparation for 5G. Indeed, Sprint has launched “Gigabit Class LTE” in New Orleans, and T-Mobile claims to have achieved near-gigabit speeds on its LTE network.³² Similarly, AT&T and Verizon continue to densify their mobile networks, leading to improved quality, all else equal, with important improvements in speed as a result.³³ Consumers in various cities can

³⁰ Piper Jaffray, “Survey of Mobile Users Points to Sizable Pent-Up Demand With Unlimited Data,” March 1, 2017, pp. 1, 5.

³¹ T-Mobile, “Netflix On Us,” *available at* <https://support.t-mobile.com/docs/DOC-36253>.

³² Akamai, “State of the Internet Q1 2017 Report,” p. 45, *available at* <https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf>.

³³ See e.g., Open Signal, “State of Mobile Networks: USA (February 2017),” *available at* <https://opensignal.com/reports/2017/02/usa/state-of-the-mobile-network>.

already obtain mobile data speeds of 50 Mbps or more, comparable to or in excess of speeds offered by fixed broadband providers.³⁴

21. Beyond that, the emergence of fixed wireless services, through which traditionally mobile providers target landline replacements, will further accelerate the convergence of fixed and mobile technologies (just as occurred in voice services, where the distinction between landline and mobile has effectively lost all economic relevance). AT&T lab trials for fixed wireless have achieved speeds up to 14 Gbps.³⁵ Other firms have reported field trials with even higher speeds, including 15.4 and 25.2 Gbps in France, 24.7 Gbps in Turkey, and 35 Gbps in Singapore.³⁶ Google, following its acquisition of fixed wireless provider Webpass, has begun offering fixed wireless broadband with speeds of up to 1 Gbps to residential consumers in six cities and is transitioning its Google Fiber initiative to focus on fixed wireless.³⁷ Verizon tested its first fixed wireless network in Ann Arbor, Michigan in May 2017 and has plans for at least ten more tests by the end of 2017.³⁸

22. And, of course, looming on the horizon, the deployment of 5G technology will further increase the competitiveness of mobile broadband Internet access services:

- The 5G mobile standard, which will bring further dramatic improvements in mobile broadband quality is currently in field trials, and it is our understanding that AT&T expects initial commercial deployments to begin as early as late 2018.

³⁴ Tom's Guide, "The Fastest Wireless Network of 2017," March 28, 2017, *available at* <https://www.tomsguide.com/us/best-mobile-network,review-2942.html>.

³⁵ AT&T press release, "AT&T details 5G evolution," January 4, 2017, *available at* http://about.att.com/story/att_details_5g_evolution.html.

³⁶ Akamai, "State of the Internet Q1 2017 Report", p. 45, *available at* <https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf>.

³⁷ Bernie Arnason, "Google Fiber Now Pushing Gigabit Fixed Wireless," *Telecompetitor*, January 31, 2017, *available at* <http://www.telecompetitor.com/google-fiber-now-pushing-gigabit-fixed-wireless/>.

³⁸ Corinne Reichert, "Samsung and Cisco build 5G Verizon trial network," *ZDNet*, May 11, 2017, *available at* <http://www.zdnet.com/article/samsung-and-cisco-build-5g-verizon-trial-network/>.

- Ericsson states that its 5G equipment will provide “ultra-high reliability” along with “very high data rates” and “very low latency.”³⁹ The 5G specification calls for peak throughput of 20 Gbps for downloads and an ability to support one million devices per square kilometer.⁴⁰ Customers are likely to experience speeds of more than one Gbps.⁴¹
- 5G is expected to further collapse the boundaries between fixed and mobile wireless, by making fixed wireless an even more robust competitor to wireline. For example, according to news site Telecompetitor, “[t]he advent of 5G, and specifically pre-5G, will enable larger tier one carriers like Verizon and AT&T to enter the gigabit fixed wireless space as well.”⁴²
- Industry observers recognize that 5G will accelerate the trend toward convergence of fixed and mobile wireless, stating that the “most obvious application of 5G is as a replacement for traditional home internet service. And it’s coming really soon, with Verizon and AT&T already investing in trials in the US.”⁴³

The evidence we present above makes clear that fixed and mobile wireless are substitutes for many consumers today, and that will increasingly be the case as providers build small cell networks and commercially deploy 5G networks beginning as early as late 2018.

³⁹ Ericsson, “5G Radio Access,” April 2016, p. 1, *available at* <https://www.ericsson.com/assets/local/publications/white-papers/wp-5g.pdf>.

⁴⁰ Akamai, “State of the Internet Q1 2017 Report,” p. 45, *available at* <https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf>.

⁴¹ Rishabh Jain, “5G Rollout in the US: Expected Launch Date, Speeds and Functionality,” *International Business Times*, September 10, 2017, *available at* <http://www.ibtimes.com/5g-rollout-us-expected-launch-date-speeds-functionality-2586761>.

⁴² Bernie Arnason, “Google Fiber Now Pushing Gigabit Fixed Wireless,” *Telecompetitor*, January 31, 2017, *available at* <http://www.telecompetitor.com/google-fiber-now-pushing-gigabit-fixed-wireless/>.

⁴³ Roger Cheng, “Not just speed: 7 incredible things you can do with 5G,” *Cnet*, March 2, 2017, *available at* <https://www.cnet.com/news/5g-not-just-speed-fifth-generation-wireless-tech-lets-you-do-vr-self-driving-cars-drones-remote/>.

23. These trends are critical to analysis of regulation because regulatory regimes should be forward looking in the sense that they should reflect expected technological and market developments, such as the expected future state of competition.⁴⁴ For example, the OECD Guiding Principles for Regulatory Quality and Performance state that, in the face of continual and far-reaching social, economic, and technological changes, governments should “ensure that their regulatory structures and processes are relevant and robust, transparent, accountable *and forward-looking*.”⁴⁵ To implement regulation based only on the state of convergence today, even as consumers increasingly view mobile and fixed broadband as substitutes for one another, would ensure that the regulation would quickly become outdated and need to change to keep up, increasing the costs associated with regulatory burdens and uncertainty. Rigid reliance on historical data from past mergers as a guide to forward-looking policymaking would exacerbate the problem.

24. Dr. Evans relies on the fact that some consumers choose to purchase mobile wireless in addition to their fixed broadband Internet access to conclude that fixed and mobile broadband are not substitutes.⁴⁶ This logic is invalid. As with any two products or services, fixed and mobile broadband need not be perfect substitutes for there to be competition between them. Their somewhat differentiated characteristics may make mobile and fixed broadband complements for some users, but only some consumers, not all, need to be willing and able to substitute to render fixed and mobile broadband economic substitutes.⁴⁷

⁴⁴ To be clear, this is a different discussion than the treatment of costs in price regulation. For a discussion of forward-looking cost, see William Rogerson (2011), “On the Relationship Between Historic Cost, Forward Looking Cost and Long Run Marginal Cost,” *Review of Network Economics* 10(2).

⁴⁵ Organisation for Economic Co-operation and Development (2005), “OECD Guiding Principles for Regulatory Quality and Performance,” p. 1 (emphasis added).

⁴⁶ *Evans White Paper*, p. 16.

⁴⁷ See, e.g., Jerry Hausman and J. Gregory Sidak (2014), “Telecommunications Regulation: Current Approaches with the End in Sight,” in Nancy L. Rose (ed.), *Economic Regulation and Its Reform: What Have We Learned?*, pp. 345-406, p. 400 (“Consider the decision of an incumbent to increase prices 5 percent above the competitive level in a given market. Because competition takes place at the margin,

25. The relevant exercise from the standpoint of competition and market definition is to consider the likely consumer reactions to an increase in fixed broadband prices. The fact that mobile broadband provides service comparable to that of fixed broadband, as described above, means that if fixed broadband prices were to increase, many consumers today (and a growing number in future) would be expected to drop their fixed broadband—which does not offer mobility—in favor of mobile broadband. The substitution need not be complete for the products to be economic substitutes; in response to a price increase, consumers could choose to purchase a minimal fixed broadband plan and rely more heavily on their mobile wireless plan. Indeed, the fact that fixed broadband consumers also have mobile wireless plans likely makes it *easier* for consumers to switch some or all of their usage to their mobile plan if fixed broadband prices go up, meaning the products are economic substitutes.⁴⁸

B. THERE IS NO ECONOMIC SUPPORT FOR THE CLAIM THAT PROVIDERS OFFERING SERVICE BELOW 25/3 MBPS SHOULD BE EXCLUDED FROM THE RELEVANT MARKET

26. Dr. Evans claims that a download speed of 25 Mbps and upload speed of 3 Mbps is required in order for a fixed broadband service to be an effective competitor in the broadband market and that “slower-speed providers do not impose significant competitive constraints.”⁴⁹ As support for his claim, he points to the Commission’s definition of such services as “advanced telecommunications service[s],” and he estimates that slower services have “just 15.7 percent of broadband connections.”⁵⁰ Dr. Evans’ claim is problematic for several reasons.

only a small proportion of the ILEC's customers need to defect to defeat its attempted price increase.”).

⁴⁸ For example, a consumer may subscribe to both the Washington Post and the New York Times, but that does not mean that the two papers are not substitutes. If the price of one were to go up, many consumers would be likely to drop their subscriptions and buy only the other, making them economic substitutes.

⁴⁹ *Evans White Paper*, note 4.

⁵⁰ *Evans White Paper*, notes 3 and 4.

27. First, the Commission has never suggested that the 25/3 Mbps threshold could be used to define relevant economic markets.⁵¹ Instead, the Commission adopted that threshold solely for the purpose of determining whether “advanced telecommunications capabilities” are being reasonably and timely deployed.⁵² In this respect, the threshold reflects an aspirational goal, a standard that requires that numerous individuals in the same household can simultaneously use the service to stream high definition video, as well as high quality voice, data and graphics.⁵³ This does not constitute an economically meaningful way to define markets for purposes of analyzing competition, which depends on the willingness of consumers to substitute across services.

28. In addition, households of different sizes have different bandwidth needs.⁵⁴ For example, households with only two people, even if they often watch different HD streams

⁵¹ We understand that the Commission set the 25/3 Mbps threshold in response to a Congressional mandate that the Commission determine the “availability of advanced telecommunications capability to all Americans” and to determine whether such capability “is being deployed to all Americans in a reasonable and timely fashion.” The Commission Report also states that the 25/3 Mbps standard was adopted to “place America at the forefront of broadband offerings,” clearly implying that the speeds are much faster than those that would be needed for typical usage. See Federal Communications Commission, 2015 Broadband Progress Report, *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 14-126, (hereinafter, *2015 Broadband Progress Report*), ¶ 19, which cites the law.

⁵² In other contexts, the Commission relies on different thresholds. For example, for purposes of determining eligibility for broadband support pursuant to the Connect America Fund, the Commission requires a 10/1 service. (Federal Communications Commission, Report and Order, *In the Matter of Connect America Fund; ETC Annual Reports and Certifications; Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. § 160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks*, WC Docket No. 10-90, 14-58, and 14-192, December 11, 2014, ¶ 15 available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-190A1.pdf (“[W]e adopt a new minimum speed standard of 10 Mbps downstream and 1 Mbps upstream (10/1 Mbps)...”).)

⁵³ *2015 Broadband Progress Report*, ¶ 47.

⁵⁴ Indeed, the Commission used a different speed threshold to determine whether schools and classrooms had access to “advanced telecommunications services.” (*2015*

simultaneously, would find 10 Mbps to be adequate.⁵⁵ So too might households with multiple adults that generally limited their broadband activities to email, web searches and other low bandwidth activities. Given that markets are defined by “marginal” customers—those most likely to substitute in response to a price change—the ability for households with low usage levels to switch to slower speeds might be particularly important in determining the market boundaries and the constraints on broadband Internet access provider pricing.

29. Second, it is invalid as a matter of economics to drop products or services from an analysis of a market due to their “small” share. Simply dropping products with small shares does not follow any accepted methods of market definition, which are based on whether products are substitutes for one another, not the level of their market share. A proper analysis should include all substitutes in the market. And share is only one indicator of a product’s competitive significance. The more important question for an analysis of competition is not share but the product’s ability to discipline price or quality changes. Excluding products with a small share before any analysis is performed prevents consideration of whether those products act (or could act) as competitive constraints. As discussed below, given that most households do not avail themselves of 25 Mbps of throughput even at peak utilization, it is reasonable to conclude that lower speed services indeed serve as a competitive constraint.

30. Finally, it appears that many customers *have chosen* slower-speed services even when faster services offering 25 Mbps or higher speeds are available. The Commission recently reported that about 90 percent of Americans had access to “Fixed Advanced Telecommunications Capability” (defined as 25/3 Mbps) as of the end of 2014 (increasing to

Broadband Progress Report, ¶ 26.) Although the benchmark recommended for schools is higher (a download speed of 100 Mbps per 1,000 students), it is not higher on a per-person basis than the household standard. But the key point is that, if the Commission’s threshold is used for market definition purposes, different size households would fall in different markets.

⁵⁵ The Commission stated, “Each household is unique: some households may not require a 25 Mbps/3 Mbps connection, but many do.” (2015 *Broadband Progress Report*, ¶ 51). The Commission also noted that slower speeds may be adequate for many purposes: “10 Mbps/1 Mbps will accommodate a variety of broadband services.” (2015 *Broadband Progress Report*, ¶ 52.)

93 percent by June 2016),⁵⁶ but that the adoption rate for such service was only 37 percent as of the end of 2014.⁵⁷ This indicates that substantially less than half of those to whom a 25/3 service was available actually chose that service, indicating that slower services are meaningful substitutes (certainly in the time period that Dr. Evans has analyzed). Moreover, we understand that many customers with 25+ Mbps service do not make full use of that service. For example, “[a]ccording to AT&T’s recent weekly data, fewer than 12 percent of its customers with a fixed 24 Mbps download connection achieved a peak utilization in any 15-minute window of even 50 percent.”⁵⁸

31. Ultimately, the relevant question is what options are available to buyers if broadband Internet access providers try to harm edge provider access—hurting an important dimension of quality. It is illogical to rule out slower broadband Internet access providers simply because they are weaker on another dimension. Surely many consumers would prefer a 15 Mbps connection and full access to Netflix compared to a 25 Mbps connection with inferior access to Netflix. Indeed, Netflix indicates that video “[t]itles will play in HD as long as you have a connection speed of 5.0 megabits per second or faster.”⁵⁹ Similarly, a recent study found that the “vast majority of online activities,” including HD video, “appear to be accessible with 5.0 Mbps or less,” but “beyond 5 Mbps, the value [a] subscriber obtains from

⁵⁶ 2016 Broadband Progress Report, Appendix D; Federal Communications Commission, Thirteenth Section 706 Report Notice of Inquiry, *In the Matter of Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, GN Docket No. 17-199, rel. August 8, 2017, ¶ 41.

⁵⁷ 2016 Broadband Progress Report, Appendix H.

⁵⁸ Opening Comments of AT&T Services, Inc., *In the Matter of Inquiry Concerning Deployment of Advance Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, GN Docket No. 17-199, September 21, 2017, p. 7.

⁵⁹ Netflix, “Internet Connection Speed Recommendations,” available at <https://help.netflix.com/en/node/306>.

further increases will depend on factors like how many connected devices operate at a single time and the types of connections she requires.”⁶⁰

C. DR. EVANS’ ANALYSIS OVERSTATES SWITCHING COSTS AND SEARCH COSTS AS FACTORS LIMITING COMPETITION

32. Dr. Evans states that wired broadband subscribers face significant switching costs and he characterizes “aggressive win-back efforts” as a tactic used by fixed broadband providers to try to prevent subscribers from switching.⁶¹ As evidence of high switching costs, Dr. Evans cites the Commission’s conclusions that actual switching rates among wired broadband providers are low.⁶² Rather than demonstrating that high switching costs limit competition, however, the aggressive “win-back” and “save desk” efforts that Dr. Evans cites, which effectively limit observed switching rates, are instead a powerful *demonstration* of competition at work.

33. The ability of subscribers to switch fixed broadband providers is demonstrated by the fact that churn is an important strategic focus of broadband providers.⁶³ Customers thinking about leaving their broadband provider must call to disconnect service, and they are then routinely referred to “save desks” that will offer substantial discounts or other inducements to persuade the customers to stay.⁶⁴ The ability to switch leads firms to offer substantial

⁶⁰ Yu-Hsin Liu, Jeffrey Prince, and Scott Wallsten, “Distinguishing Bandwidth and Latency in Households’ Willingness-to-Pay for Broadband Internet Speed,” *Technology Policy Institute*, August 2017, pp. 3-4.

⁶¹ *Evans White Paper*, pp. 11-12.

⁶² *Evans White Paper*, p. 12.

⁶³ See, e.g., “AT&T (T) Q1 2017 Results – Earnings Call Transcript,” April 26, 2017, *available at* <https://seekingalpha.com/article/4065304-t-t-q1-2017-results-earnings-calltranscript?part=single>; and Trefis, “Comcast Earnings: Growth in NBCUniversal, High-Speed Internet And Cable TV Continues To Boost Revenues,” *Nasdaq.com*, January 27, 2017, *available at* <http://www.nasdaq.com/article/comcast-earnings-growth-nbcuniversal-high-speed-internet-and-cable-tv-continues-to-boost-revenues-cm739677>.

⁶⁴ See, e.g., Nova Safo, “Want to save money? Call your cable company.” *Marketplace*, October 9, 2014, *available at* <https://www.marketplace.org/2014/10/09/business/want-save-money-call-your-cable-company> (“‘It costs companies five times as much to acquire a new customer than it does to keep an old one.’ So, it is a factored-in cost of

inducements to stay, thus limiting observed switching, but also benefiting even those customers who ultimately choose not to switch.

34. The fact that consumers have—and can make use of—a credible threat to switch fixed broadband providers is well recognized in the industry. For example, Consumer Reports has advocated that consumers ask for discounts for Internet service.⁶⁵ The implied threat, of course, is that they will take their business elsewhere if they do not get a better deal, and the credibility of a threatened switch is demonstrated by the companies’ reactions to such requests. For example, a survey by Consumer Reports in 2012 found that roughly a third of consumers surveyed had, in fact, asked for discounts and over 90 percent of them had obtained discounts or upgrades as a result.⁶⁶ If switching were as difficult and expensive as Dr. Evans claims, we would not expect to see providers offer significant discounts to retain customers.

35. Critically, the ability to switch readily can be present even with modest churn rates. To understand the relevant competitive dynamic, one must examine whether *threats* of

doing business to provide discounts or other incentives for customers who call and ask.”). See also Nicholas Maechler, Kevin Neher & Robert Park, “From touchpoints to journeys: seeing the world as customers do,” McKinsey & Company, March 2016, *available at* <https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/from-touchpoints-to-journeys-seeing-the-world-as-customers-do> (“In economic terms, a retained customer delivered significantly greater profitability than a newly acquired customer over two years. Churn, due to pricing, technology, and programming options, was an increasingly familiar problem in this hypercompetitive market. So was retention. The common methods for keeping customers were also well known but expensive—tactics like upgrade offers and discounted rate plans, or ‘save desks’ to intercept defectors.”).

⁶⁵ See, e.g., Consumer Reports, “Telecom Service Buying Guide,” September 2016, *available at* <http://www.consumerreports.org/cro/telecom-services/buying-guide.html>; and Consumer Reports, “Haggling for a lower telecom bill really works, says one CR editor,” May 17, 2012, *available at* <http://www.consumerreports.org/cro/news/2012/05/haggling-for-a-lower-telecom-bill-really-works-says-one-cr-editor/index.htm>.

⁶⁶ Consumer Reports, “Haggling for a lower telecom bill really works, says one CR editor,” May 17, 2012, *available at* <http://www.consumerreports.org/cro/news/2012/05/haggling-for-a-lower-telecom-bill-really-works-says-one-cr-editor/index.htm>.

switching discipline providers. “[A]ggressive win-back techniques” undertaken by wired broadband providers’ save desks, as Dr. Evans discusses, show that subscriber threats to switch do provide such discipline. Successful win-back efforts not only are beneficial to subscribers but also will depress switching rates. More generally, fierce competition does not require all customers to regularly change providers, or even necessarily a large portion of them. Rather, as long as a reasonable portion of customers have the ability to change providers, efforts to retain customers are an indication that there are a significant number of marginal customers, with competition for these customers driving effective competition.

36. This threat to switch is also one factor that serves to discipline Internet provider behavior regarding the quality of service offered. Surveys indicate that consumers would switch if they felt their broadband provider started to block, slow down, or impose other restrictions on the content they demanded.⁶⁷ Again, this is competition in action: anti-consumer actions by broadband providers would lead to substantial costs in the form of consumer departures.

37. Dr. Evans’ claim that consumers cannot tell whether a quality degradation is due to the actions of the broadband provider or the edge provider (and so would not know who to blame in the event of a service degradation) is difficult to reconcile with the facts.⁶⁸ Consumers have many sources of information regarding quality. For example, Netflix and Google

⁶⁷ Glenn Derene, “71% of U.S. households would switch from providers that attempt to interfere with Internet,” *Consumer Reports*, February 18, 2014, *available at* <https://www.consumerreports.org/cro/news/2014/02/71-percent-of-households-would-switch-if-provider-interferes-with-internet-traffic/index.htm>. See also Mark A. Israel, “Economic Analysis of the Effect of the Comcast-TWC Transaction on Broadband: Reply to Commenters,” Exhibit 1 to Opposition to Petitions to Deny and Response to Comments, *In the Matter of Applications of Comcast Corp., Time Warner Cable Inc., Charter Communications, Inc., and SpinCo For Consent To Assign or Transfer Control of Licenses and Authorizations*, MB Docket No. 14-57, September 22, 2014 (hereinafter *Israel Comcast-TWC Reply Declaration*), Appendix I (discussing a survey that Global Strategy Group (GSG) conducted, which found that “[a] high percentage of broadband users are likely to switch to another Internet service provider (ISP) if their current ISP were to take any of the following actions: ‘prevent access to favorite websites;’ ‘slow down Internet speeds for your favorite websites.’”).

⁶⁸ See, e.g., *Evans White Paper*, p. 43.

publish comparisons of broadband service provider speeds, holding the edge provider constant.⁶⁹ In addition, edge providers often have direct customer relationships (a provider/subscriber relationship) that they can use to convey information about service quality. No broadband provider could reasonably think that it could materially harm an edge provider's ability to compete without the edge provider (or content delivery network (CDN), etc.) making this clear and blaming the broadband service provider.

38. Moreover, the loss to broadband providers if they harm the quality of their offering comes not just from the fact that some customers would switch away to other providers. Given the importance of high-quality edge provider services to consumer demand for broadband services, any action that a broadband provider might undertake to harm edge providers would degrade the value of its broadband service to consumers and thus reduce customer willingness to pay for broadband. The better is the offering, the more customers will be willing to pay for it, and broadband providers capture that value in the form of higher revenues. Thus, broadband providers have an incentive to maintain high-quality access to edge providers in order to maximize customer willingness to pay. Any strategy that reduces the availability or attractiveness of edge services would reduce demand for broadband services, potentially causing customers to switch to rival broadband providers or to reduce their overall consumption of broadband services, either of which would harm the broadband provider's profits.

⁶⁹ Netflix measures "prime time Netflix performance on particular ISPs." (See "Netflix ISP Speed Index," *available at* <https://ispspeedindex.netflix.com/country/us/>; see also <https://ispspeedindex.netflix.com/about/>.) Google's broadband comparison categorizes ISPs as "YouTube HD Verified," "Standard Definition," and "Lower Definition" based on "the video streaming quality [one] can expect (at least 90% of the time)" on YouTube. (See "Google Video Quality Report," *available at* <https://www.google.com/get/videoqualityreport/>; see also <https://www.google.com/get/videoqualityreport/#methodology>.) Similarly, fast.com performs speed tests by downloading data from Netflix servers. (See <https://fast.com/>.)

D. DR. EVANS' CLAIM THAT BROADBAND COMPETITION REQUIRES MORE THAN TWO COMPETITORS IS INCORRECT

39. Dr. Evans claims that neither the facts of the broadband industry nor economic theory supports the idea that two competitors can be adequate to ensure effective competition.⁷⁰ He is incorrect: Economics teaches that in markets such as broadband Internet access, the presence of two competitors can result in effective competition. This conclusion follows because the provision of broadband Internet service requires a firm to earn high margins on incremental subscribers to cover high fixed costs and generate an economic return. In that setting, there is intense competition for those marginal subscribers, as evidenced by save-desk concessions to avoid losing them.

40. As Dr. Israel has previously explained in the Business Data Services proceeding:⁷¹

[T]he characteristics of the BDS marketplace imply that, where an ILEC faces at least one competitor, competition is likely to be intense. An investment in BDS network facilities effectively represents a durable commitment by the provider to specific geographic locations. This follows because such investments are in large part economically “sunk,” which means that the relevant variable costs exclude those sunk costs, giving all providers in the area low variable costs to serve new business and thus strong economic incentives to serve any available business in the area. These sunk investments thus thrust rivals into vigorous price competition. Stated differently, when there are two

⁷⁰ *Evans White Paper*, note 75.

The fact that competition can be intense even with a small number of competitors is well known in economics. For example, Professors Joseph Farrell and Carl Shapiro have noted that “high concentration can be compatible with vigorous competition and efficient market performance.” Joseph Farrell and Carl Shapiro (2008), “Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition,” UC Berkeley Competition Policy Center Working Paper, p. 4.

⁷¹ Mark Israel, Daniel Rubinfeld, and Glenn Woroch, “Analysis of the Regressions and Other Data Relied Upon in the Business Data Services FNPRM and a Proposed Competitive Market Test,” *In the matter of Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access Rates for Price Cap Local Exchange Carriers; AT&T Corp. Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Service*, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, August 9, 2016, p. 2.

BDS providers, both rivals have every incentive to maximize the return on their network investments.

41. The logic that sunk investment tends to create intense competition is well supported in the economic literature and applies to the broadband industry. For example, as Richard Gilbert observes, “sunk costs are likely to contribute to exit barriers,”⁷² and where such exit barriers exist, firms have strong incentives to stay and compete even as prices fall because they do not wish to walk away from the large, unrecoverable investments they have already made. Put another way, once the broadband access network is in place, even a small return is better than no return. Due to large, sunk customer acquisition costs, firms are willing to compete aggressively to prevent customers from switching, including via substantial save-desk promotions.

42. Indeed, the Commission has previously found that, in the presence of large sunk costs with respect to business data services, most of the benefits of additional competition appear with the introduction of a second provider. As the Commission explained:⁷³

[T]here is a substantial competitive effect when a wireline competitor is present to discipline rates, terms, and conditions to just and reasonable levels. ... [T]here is a general expectation that the largest benefits from competition come from the presence of a second provider, with added benefits of additional providers falling thereafter, in part because, consistent with other industries with large sunk costs, the impact of a second provider is likely to be particularly profound in the case of wireline network providers. A wireline

⁷² Richard Gilbert (1989), “Mobility Barriers and the Value of Incumbency,” in Richard Schmalensee and Robert Willig (eds.), *Handbook of Industrial Organization*, Vol. 1, p. 520.

⁷³ Federal Communications Commission, Report and Order, *In the Matter of Business Data Services in an Internet Protocol Environment; Special Access for Price Cap Local Exchange Carriers; Technology Transitions; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 05-25, GN Docket No. 13-5, RM-10593, FCC 17-43, rel. April 28, 2017, ¶120 (“In addition, we find that the presence of a nearby competitor is likely to prevent substantial abuse of market power, whether through high prices or lack of innovation, and equally that a lack of actual supply by a nearby competitor likely arises when existing suppliers’ offerings are reasonable in both price and service characteristics.”). See also *id.* ¶¶ 15, 53.

provider is willing to cut prices to as low as the incremental cost of supplying a new customer, requiring minimal contribution to its sunk costs.

43. Dr. Evans makes several related claims in support of his position, none of which refute the points we make above.⁷⁴ First, he asserts that one should expect to see more switching if competition is intense. As discussed in Section II.C, intense competition should lead to strong reactions to the threat of switching, which we do observe in this industry. Second, he asserts that broadband providers' customer service quality rankings would be higher if competition were more intense. Cross-industry comparisons of customer service rankings do not provide a valid measure of economic competition. For example, they do not control for cross-industry differences (e.g., broadband networks can be prone to outages and broadband Internet access providers require thousands of field representatives) and customer perceptions tend to lag actual customer service performance. Finally, Dr. Evans argues that economic theory does not support a broad supposition that two competitors will always be sufficient to achieve effectively competitive markets. We agree with this statement as a general theoretical proposition, but it does not refute our points, which are: (i) that one cannot conclude from observing that there are only two competitors that competition is insufficient, and (ii) that economic theory supports a conclusion that two competitors are likely to be sufficient *in this industry in particular* (which in fact has more than two competitors in many areas).

III. DR. EVANS' ANALYSIS OF BROADBAND INTERNET ACCESS PROVIDERS' INCENTIVES AND ABILITY TO HARM EDGE PROVIDERS IS INCOMPLETE AND FLAWED

44. Dr. Evans asserts that large broadband Internet access providers have the incentive and ability to harm edge providers (especially those providing video content) through degraded interconnection arrangements and/or higher interconnection costs.⁷⁵ However, the facts do not support Dr. Evans' theories and concerns. Specifically, as we describe in greater detail below, Dr. Evans ignores the implications of the small size of interconnection payments, the proliferation of video edge providers and the success they are enjoying, and the high cost and

⁷⁴ Evans White Paper, note 75.

⁷⁵ Evans White Paper, p. 5.

limited (or likely negative) benefits to broadband Internet access providers of degrading their service by limiting edge provider access to their networks.

A. INTERCONNECTION FEES ARE EXTREMELY SMALL

45. Dr. Evans' primary "evidence" that broadband Internet access providers have the incentive and ability to harm edge providers is the fact that certain broadband Internet access providers have negotiated interconnection fees with certain edge providers such as Netflix.⁷⁶ Specifically, Dr. Evans draws a connection between broadband Internet access provider size, bargaining leverage and the magnitude of interconnection fees. He does so by referring to conclusions that the DOJ and FCC reached in reviewing the Comcast-Time Warner Cable and Charter-Time Warner Cable mergers wherein they found that larger broadband Internet access providers charged higher interconnection fees than smaller broadband Internet access providers.⁷⁷

46. However, in focusing on the relationship between size and fees, Dr. Evans ignores a more fundamental point. Based on all available public information—including statements by Netflix—interconnection fees are tiny by any relevant measure, a fact that is inconsistent with a claim that broadband Internet access providers possess market power vis-à-vis edge providers or that interconnection fees are harmful.⁷⁸ If broadband Internet access providers

⁷⁶ *Evans White Paper*, p. 19 ("As of that time, five BIAS providers, accounting for 71.2 percent of all subscribers, had imposed access fees on some edge providers. The hundreds of smaller BIAS providers do not impose access fees.").

⁷⁷ *Evans White Paper*, pp. 47-49.

⁷⁸ Declaration of Kevin McElearney, Exhibit 4 to Applicants' Opposition to Petitions to Deny and Response to Comments, *In the Matter of Applications of Comcast Corp., Time Warner Cable Inc., Charter Communications, Inc., and SpinCo for Consent To Assign or Transfer Control of Licenses and Authorizations*, MB Docket No. 14-57, September 23, 2014, ¶ 44 (hereinafter *McElearney Declaration*) (indicating that Netflix wrote to Comcast after the interconnection deal that "[w]e found middle ground on our issues that worked well for both of us for the long term, and works great for consumers" and "you [Comcast] made paid peering affordable for us."); "Netflix's (NFLX) CEO Reed Hastings on Q2 2014 Results – Earnings Call Transcript," July 21, 2014, *available at* <http://seekingalpha.com/article/2327585-netflixs-nflx-ceo-reedhastings-on-q2-2014-results-earnings-call-transcript> ("[o]n a short term basis I think there is great assurances in the sense that we've been able to sign these immediate interconnect deals and still able to achieve our margin targets...")

are attempting to use market power to impose burdensome fees on edge providers, they are doing a strikingly poor job of it.

47. Where broadband Internet access providers have entered into commercial agreements for direct interconnection, the relevant fees have been very low, generally at or below market prices for transit, which themselves have plummeted over time and serve as an alternative option for interconnection.⁷⁹ As a result, payments for direct interconnection make up only a very small and competitively insignificant portion of edge providers' costs and an even smaller percentage of edge providers' revenue (the relevant comparison to assess what effect such charges could possibly have on edge provider prices, even if fully passed through).⁸⁰ Indeed, public statements made by Netflix itself confirm that the direct interconnection agreements did not have a material impact on its margins.⁸¹ Such a pattern is not consistent with a claim that broadband Internet access providers control a critical input (direct

– Netflix CFO David Wells). See also Federal Communications Commission, Memorandum Opinion and Order, *In the Matter of Applications of XO Holdings and Verizon Communications Inc. For Consent to Transfer Control of Licenses and Authorizations*, WC Docket No. 16-70, DA 16-1281, November 16, 2016, ¶ 44 (“Although the transit market has been marked by increasing consolidation in recent years, transit prices have been declining sharply since the late 1990s,” citing data from DrPeering).

In Section III.D, we describe the ability of content providers to quickly route traffic to multiple interconnection points.

⁷⁹ See *McElearney Declaration*, ¶¶ 4, 18 (citing data from drpeering.net).

⁸⁰ “Netflix’s (NFLX) CEO Reed Hastings on Q2 2014 Results – Earnings Call Transcript,” July 21, 2014, *available at* <http://seekingalpha.com/article/2327585-netflixs-nflx-ceoreed-hastings-on-q2-2014-results-earnings-call-transcript> (“I think for Netflix content is our largest cost. It dwarfs all the other costs...” — Netflix CFO David Wells).

⁸¹ “Netflix’s (NFLX) CEO Reed Hastings on Q2 2014 Results – Earnings Call Transcript,” July 21, 2014, *available at* <http://seekingalpha.com/article/2327585-netflixs-nflx-ceoreed-hastings-on-q2-2014-results-earnings-call-transcript> (“On a short term basis I think there is great assurances in the sense that we’ve been able to sign these immediate interconnect deals and still able to achieve our margin targets.” — Netflix CFO David Wells).

interconnection into their last-mile networks) without which Netflix or other edge providers cannot compete successfully.

48. Dr. Evans' claim is premised on the theory that broadband Internet access providers are raising rivals' costs (in this case, those of video edge providers) in order to competitively disadvantage them. Such a theory requires that a firm materially raise its rivals' costs in order to soften competition. However, Dr. Evans provides no evidence that broadband Internet access providers have materially raised any edge provider's costs, much less that they have done so in a way that harms competition. Even though INCOMPAS is in a position to know what its members are paying for interconnection, it has not supplied any evidence that these fees are significant on their own or as a share of the total costs faced by content providers, or even that they are higher than the costs that edge providers previously paid to CDNs to interconnect.

49. Even more importantly, we have seen no evidence—and, certainly, Dr. Evans offers none—that the payments for direct interconnection from these edge providers exceed the marginal cost (including the capital cost required to expand capacity as traffic grows) that their traffic imposes on broadband Internet access provider networks, and there is substantial evidence to the contrary.⁸² This comparison is particularly telling because standard theories regarding harm from the alleged exercise of market power involve setting marginal prices over marginal costs, thus inefficiently reducing output. Because broadband Internet access providers typically charge customers nothing for subscribing to a given edge provider and little if anything for consuming additional data, the marginal revenue associated with an increase in traffic from edge providers comes primarily from the edge provider side of the market. Unless interconnection fees are above marginal cost, there is no basis to say that such fees are consistent with a standard market power claim of prices greater than marginal costs. And, as Dr. Evans acknowledges, “[t]he assessment of socially optimal pricing in the case of

⁸² In the context of broadband Internet access networks, “marginal cost” refers to the incremental costs that additional traffic imposes on the network in the form of increased capital and operating expenditures. For a discussion of how these costs can be calculated, see *Israel Comcast-TWC Reply Declaration*, Appendix III.

multi-sided platforms is complex and involves both setting the pricing levels as well as the structure of prices for both sides.”⁸³

50. Netflix’s interconnection agreements provide good examples from which to compare direct interconnection prices to associated marginal costs. Publicly available evidence indicates that Netflix’s payments to Comcast and Time Warner Cable (TWC) for direct interconnection were *below* the marginal costs of serving Netflix’s traffic.⁸⁴ In TWC’s case, its Chief Strategy Officer stated publicly that the price that it charged Netflix for direct interconnection was *below* the marginal costs of serving Netflix’s traffic “by orders of magnitude.”⁸⁵ More generally, the publicly available evidence indicates that broadband Internet access providers’ prices for direct interconnection are below the marginal costs of the associated traffic for a wide variety of edge providers and their agents.⁸⁶ Thus, the available evidence indicates that the magnitude of interconnection fees is not consistent with a claim of broadband Internet access provider market power.

B. INTERCONNECTION FEES HAVE LONG EXISTED

51. Dr. Evans’ claim that charges to edge providers are a new phenomenon is incorrect.⁸⁷ CDNs have long paid interconnection fees.⁸⁸ All that is changing is that some edge providers now act as their own CDNs.⁸⁹ The fact that edge providers pay interconnection fees when they act as a CDN is not a break with standard marketplace practice. What *would* be a break

⁸³ *Evans White Paper*, note 136.

⁸⁴ *Israel Comcast-TWC Reply Declaration*, ¶¶ 137-138.

⁸⁵ *Israel Comcast-TWC Reply Declaration*, ¶ 137.

⁸⁶ *Israel Comcast-TWC Reply Declaration*, ¶ 138.

⁸⁷ *Evans White Paper*, p. 18.

⁸⁸ See, e.g., Stanley M. Besen and Mark A. Israel (2013), “The evolution of Internet interconnection from hierarchy to “Mesh”: Implications for government regulation,” *Information Economics and Policy*, 25: 235-245 (hereinafter, *Besen and Israel (2013)*), pp. 243-244 (discussing the paths by which CDNs connect to broadband Internet access provider networks).

⁸⁹ See Netflix, “How Netflix Works With ISPs Around the Globe to Deliver a Great Viewing Experience,” March 17, 2016, *available at* <https://media.netflix.com/en/company-blog/how-netflix-works-with-isps-around-the-globe-to-deliver-a-great-viewing-experience>.

from standard practice would be for large video-focused edge providers to receive free interconnection no matter the volume of traffic they deliver.

52. Direct interconnection agreements (and associated payments, whichever direction they flow) reflect the fact that when both an edge provider and an associated broadband Internet access provider are large enough, they may no longer find it efficient to use intermediaries such as third-party CDNs and transit providers. Instead, they may find it mutually beneficial to avoid the cost associated with an intermediary's services (and the associated intermediary's profit margins). Such a decision is hardly surprising and not unique to the interconnection context—the economic efficiency of “cutting out the middleman” is well recognized in economics across a wide range of industries. It may not be a good financial result for the intermediary (e.g., Cogent), but it is not a bad outcome for the edge provider (e.g., Netflix) or the broadband Internet access provider (e.g., Comcast), or for competition or consumers.

C. DR. EVANS' CLAIM THAT THE EXISTENCE OF ANY INTERCONNECTION FEE DEMONSTRATES MARKET POWER IS INCORRECT

53. Dr. Evans implies that interconnection fees of any magnitude are evidence of market power on the part of broadband Internet access providers.⁹⁰ However, as Dr. Evans acknowledges and as he has written in many contexts, in two-sided markets, charges can go to either side of the market, based on what is most efficient.⁹¹ Economic theory and available evidence indicate that any further shifts toward pricing on the edge provider side of the

⁹⁰ *Evans White Paper*, p. 19 (“[F]ive BIAS providers, accounting for 71.2 percent of all subscribers, had imposed access fees on some edge providers. The hundreds of smaller BIAS providers do not impose access fees.”). See also *Evans White Paper*, pp. 47-49 (discussing the empirical relationship between broadband Internet access provider size and interconnection fees).

⁹¹ See, e.g., *Evans White Paper*, note 136 (citing David S. Evans and Richard Schmalensee (2014), “The Antitrust Analysis of Multisided Platform Businesses,” in Roger D. Blair and Daniel Sokol (eds.), *The Oxford Handbook of International Antitrust Economics*, Volume 1, 404-448, at 411-414: “The fact that some multisided platforms charge prices in excess of marginal cost to both sides of the platform cannot by itself settle the policy debate over whether a change in pricing policy would increase or decrease social welfare. The assessment of socially optimal pricing in the case of multi-sided platforms is complex and involves both setting the pricing levels as well as the structure of prices for both sides.”).

market would in fact be an efficient move toward incremental cost prices and would reduce cross-subsidization on the customer side of the market. Interconnection fees charged to edge providers therefore do not indicate market power. We explain the economic theory underlying this conclusion below.

54. Broadband Internet access providers run two-sided platforms, which facilitate the interaction of broadband customers and edge providers.⁹² Customers derive value from interacting with edge providers. Similarly, edge providers derive value from interacting with customers.

55. A core principle of pricing in multi-sided markets is the “seesaw” principle, which Rochet and Tirole describe as follows:⁹³

[A] factor that is conducive to a high price on one side, to the extent that it raises the platform’s margin on that side, tends also to call for a low price on the other side as attracting members on that other side becomes more profitable.

The principle does not depend on market structure or the degree of competition. Rather, it is a general principle that is present in nearly all models of two-sided markets. In the present context, the implication of the seesaw principle is simple: Higher prices to edge providers or their agents for interconnection imply *lower* prices to broadband customers and vice versa. Consequently, in evaluating pricing in this context, it is critical to evaluate the impact on both sides of the market, taking into account the fact that higher prices to edge providers or their

⁹² For general articles describing the economics of two-sided markets, see Jean-Charles Rochet and Jean Tirole (2003), “Platform Competition in Two-Sided Markets,” *Journal of the European Economic Association*, 1(4): 990-1029; Jean-Charles Rochet and Jean Tirole (2006), “Two-sided markets: a progress report,” *The RAND Journal of Economics*, 37(3): 645-667 (hereinafter, *Rochet and Tirole (2006)*); E. Glen Weyl (2010), “A Price Theory of Multi-Sided Platforms,” *American Economic Review*, 100(4): 1642-1672; and David S. Evans and Richard Schmalensee (2015), “The Antitrust Analysis of Multi-Sided Platform Businesses,” in *The Oxford Handbook of International Antitrust Economics*, Volume 1, Roger Blair and D. Daniel Sokol (eds.), 404-448 (hereinafter, *Evans and Schmalensee (2015)*).

⁹³ *Rochet and Tirole (2006)*, p. 659.

agents directly imply lower prices to broadband customers and conversely that lower prices to edge providers or their agents directly imply higher prices to broadband customers.

56. The welfare effects of a decision to charge more to edge providers or their agents is an example of a long-standing question in economics, concerning the optimal split of pricing between the two sides of a two-sided market, taking the tradeoff implied by the seesaw principle into account. Economists, including Dr. Evans, have long recognized, as a general matter, that the answer depends on market-specific facts, with no presumption that prices should be higher or lower on one side of the market versus the other.⁹⁴ By Dr. Evans' own logic, therefore, there is no general theoretical support for a claim that higher prices on the edge provider side of the market (and thus lower prices on the consumer side of the market) would harm welfare.

57. To the contrary, several specific features of the broadband industry point to the conclusion that, if anything, interconnection prices charged to edge providers or their agents are likely to be welfare *enhancing* (in part because such fees would tend to lower prices to broadband customers in a socially beneficial way).

58. First, an implication of the seesaw principle is that broadband Internet access customers will pay less if edge providers or their agents pay more. Edge providers may pass on a portion of any interconnection fee to their own customers, but this pass-through

⁹⁴ See David S. Evans (2011), "Net Neutrality Regulation and the Evolution of the Internet Economy," *CPI Antitrust Chronicle*, August 2011 (2): 1-9, pp. 7-8 ("Multi-sided platform businesses may not choose the socially optimal price structures (and, therefore, may not have socially optimal prices even putting aside the exercise of market power). However, precisely figuring out the optimal price is intensely fact-specific and there are no simple rules (e.g. marginal cost pricing) to guide policymakers. Therefore, while papers such as those by Lee & Wu and Economides & Tag try to appeal to the two-sided literature to derive optimal policies it is highly unlikely that it will ever be possible to say more than 'it depends' on a number of facts, most of which are largely unknowable with the level of precision that would be needed to provide an answer. Regulating price structures involves shifting costs between different sides of the platform—not in controlling market power."); *Evans and Schmalensee (2015)* (reviewing various models of pricing in two-sided markets that arrive at different optimal pricing rules depending on the modeling assumptions).

necessarily only goes to customers who use the particular edge provider, and thus such pricing is targeted at the right customers, limiting cross-subsidization by those who do not.

59. Second, prices are the mechanisms by which firms cause buyers to “internalize” the costs their actions create. It is a well-established economic principle that the efficiency of market outcomes requires prices to reflect marginal costs (including the capital cost required to expand capacity as traffic grows).⁹⁵ Given prices that reflect marginal costs, those that interconnect with the platform (customers, edge providers, or both) can then decide how to optimize their behavior. If prices are below marginal network costs, customers and edge providers will have an incentive to “over-consume” or “over-provide” data. Under current pricing policies, neither customers nor edge providers face prices that fully reflect the marginal network costs that their actions (and interactions) create. Customer pricing is largely on a per-customer, per-month basis and often does not vary with usage. Although interconnection fees naturally do have at least some variable component, as described above, interconnection fees are generally substantially below marginal network costs. Given prices that are below marginal costs, increasing incremental prices to edge providers or their agents, in order to move them closer to marginal cost, would be efficient.

60. Charging prices that reflect marginal costs to edge providers, rather than end consumers, is likely to be economically efficient behavior. Edge providers can make investments to react to marginal cost pricing in flexible ways that are not available to consumers. Because such investments are costly, edge providers have a reduced incentive to undertake such investments (or, conversely, an increased incentive to over-invest in high-quality video, even if it generates limited consumer benefits) if they do not internalize the full costs of their actions, including the costs those actions impose on broadband Internet access providers’ networks. For example, edge providers have a variety of options to optimize their traffic, including investing in caching and compression technologies and establishing flexible

⁹⁵ Dennis W. Carlton and Jeffrey M. Perloff (2004), *Modern Industrial Organization*, 4th Edition, Prentice Hall, pp. 58, 70. See also Declaration of Mark A. Israel, “Implications of the Comcast/Time Warner Cable Transaction for Broadband Competition,” Attachment to Comcast Corporation and Time Warner Cable Inc., *Description of Transaction, Public Interest Showing, and Related Demonstrations*, April 8, 2014, note 105; and *Besen and Israel (2013)*.

pricing policies such as premium charges for consumers who stream video during congested periods.⁹⁶ Such options are not just theoretical possibilities. For example, in Canada, Netflix reduced the data requirements associated with streaming video by two thirds “with only a minimal impact on video quality” in response to data allowances used by Canadian broadband Internet access providers.⁹⁷

**D. ATTEMPTS TO DEGRADE EDGE PROVIDER ACCESS WOULD BE HIGHLY
COSTLY TO BROADBAND INTERNET ACCESS PROVIDERS**

61. Dr. Evans asserts that large broadband Internet access providers “hold significant bargaining power with respect to a given CDN or transit provider” due to the fact that broadband Internet access providers can limit port capacity to specific CDNs and transit providers.⁹⁸ However, the structure of the Internet is such that using such a strategy in an attempt to harm an edge provider would be extremely costly to broadband Internet access providers of all sizes. Indeed, Dr. Evans acknowledges that such a strategy would affect a large portion of the content that small- and medium-sized broadband Internet access providers deliver to their customers.⁹⁹ But these effects are not limited to small- and medium-sized broadband Internet access providers. Such a strategy would impose large costs on any broadband Internet access provider attempting it.

62. The collection of networks that make up the Internet interconnect with one another through a variety of physical and financial arrangements. Traditionally, two types of commercial arrangements to exchange traffic have been common:

⁹⁶ Nirmal Govind, “Optimizing the Netflix Streaming Experience with Data Science,” June 11, 2014, *Netflix Tech Blog*, available at <http://techblog.netflix.com/2014/06/optimizing-netflix-streaming-experience.html>. See also *Besen and Israel (2013)*, p. 242.

⁹⁷ Alastair Sharp, “Netflix cuts data use on Canada online service,” *Reuters*, March 29, 2011, available at <http://www.reuters.com/article/us-netflix-canada/netflix-cuts-data-use-on-canada-online-service-idUSTRE72S3BT20110329>.

⁹⁸ *Evans White Paper*, p. 40.

⁹⁹ *Evans White Paper*, p. 40.

- *Transit*: One network (e.g., a local broadband Internet access provider) or edge provider contracts with another network (e.g., a national backbone provider) to deliver its traffic to all other destinations on the Internet; and
- *Peering*: Two networks exchange traffic to be delivered to/from only one another and one another's direct customers. Peering may be either "paid" or "settlement-free," with settlement-free peering meaning that no money changes hands between connecting networks, but rather there is an exchange of roughly like "value" to terminate one another's traffic. Peering occurs not only between networks, but also is sometimes provided by a network to a CDN or large edge providers, typically on a paid basis.

63. In addition, CDNs such as Akamai, Limelight, CDNetworks, Cloud Flare, EdgeCast, Amazon CloudFront, Level 3, and a host of others play a particularly important role in the evolving Internet architecture. Edge providers, whether large or small, can contract with CDNs, which effectively provide wholesale content distribution services. These third-party CDNs cache content across geographically diverse servers in order to, among other things, reduce the costs of the delivery of content relative to the cost of traditional transit options. CDNs then negotiate interconnection arrangements with broadband Internet access providers and/or buy transit to reach smaller broadband Internet access providers.

64. Over time, the Internet has evolved from a "hierarchy"—in which interconnection was achieved by having broadband Internet access providers purchase transit services from top-level backbones, with the top-level backbones engaging in settlement-free peering with one another—to a "mesh" in which peering occurs among a much larger number of participants and some peering arrangements involve payments from one peer to another.¹⁰⁰ In this new environment, backbone providers, broadband Internet access providers, CDNs, and suppliers of content have a far wider array of interconnection alternatives, both technical and financial, than they used to.

65. In this evolving Internet architecture, there are many ways for edge providers to ensure that their traffic reaches broadband Internet access providers' networks. Some large

¹⁰⁰ See generally *Besen and Israel (2013)*.

firms, such as Netflix and Google, have invested in their own CDNs and negotiate direct access to certain broadband Internet access providers (as discussed above). Other firms rely on third-party CDNs or transit providers to deliver their content. And many rely on some combination of these options. As a result of this rich network of interconnection options, both small and large edge providers have many pathways into broadband Internet access providers' networks to deliver their content to customers.

66. Moreover, the agents of edge providers, including CDNs, themselves have many options to reach a broadband Internet access provider's network.¹⁰¹ In addition to reaching direct peering agreements with broadband Internet access providers, CDNs can and do purchase transit services from one or more of the broadband Internet access provider's peering partners, many of whom exchange traffic with the broadband Internet access provider on settlement-free terms.¹⁰² In some cases, a CDN could even elect to send traffic over a broadband Internet access provider's paid transit connection, thereby imposing costs on the broadband Internet access provider.¹⁰³ All of this means that edge providers can choose between many CDNs, each of which can itself choose between many transit options and/or direct peering to reach the broadband Internet access provider's network.

67. To degrade significantly the access of a particular edge provider to a broadband Internet access provider's last-mile network would require significant disruption to the broadband Internet access provider's own access to the broader Internet, at high cost to itself. The ability of edge providers to pool their traffic with other providers (via the use of transit providers or CDNs) and to make use of multiple paths into a broadband Internet access provider's network (either on their own or via a CDN) together mean that a broadband Internet access provider would have to degrade its connection to the overall Internet to a significant extent to prevent a particular edge provider from accessing its last-mile network.

¹⁰¹ *Besen and Israel (2013)*, pp. 243-244.

¹⁰² *Besen and Israel (2013)*, p. 243.

¹⁰³ *Besen and Israel (2013)*, p. 243 (explaining that non-Tier-1 ISPs' transit costs are a function of the volume of traffic received from the transit provider).

68. The fact that certain large edge providers have dedicated links actually *bolsters* our argument. The negotiation of direct interconnection demonstrates that these edge providers were able to negotiate terms that are more attractive than interconnecting via other routes such as transit providers or third-party CDNs. Direct interconnection agreements also provide edge providers with contractual protection in the form of service level agreements and defined interconnection terms for the period of the agreement.¹⁰⁴ Still, if a broadband Internet access provider were somehow to degrade these links, despite contracts, edge providers would have an array of interconnection options on which to fall back, including the use of transit providers and third-party CDNs.

69. Dr. Evans' assertion that broadband Internet access providers can target specific CDNs or transit providers by underproviding port capacity, while leaving other ports open so that its customers can access most content is misleading.¹⁰⁵ Major content providers and their agents (e.g., Akamai, Level 3 and Cogent) strategically choose many different entry points into the same broadband Internet access provider network and shift traffic from one to another in real time.¹⁰⁶ Therefore, broadband Internet access providers, regardless of size, cannot "degrade" any content provider's performance simply by allowing one interconnection point to become congested. In order to shut off the access of a specific content provider, broadband Internet access providers would need to degrade all such points, leading to a comprehensive deterioration in performance by the overwhelming majority of content providers. Such a

¹⁰⁴ See, e.g., *McElearney Declaration*, ¶ 20 ("When companies purchase off-net or on-net transit services from Comcast, they enter into contracts that specify the capacity that must be made available, the locations at which traffic will be exchanged, and other conventional terms and conditions of an interconnection arrangement. As a general matter, these contracts provide that the parties may request that Comcast add capacity, and (subject to the terms of the contracts) Comcast must do so in the manner described above.").

¹⁰⁵ *Evans White Paper*, p. 40.

¹⁰⁶ See David Clark et al. (2014), "Measurement and Analysis of Internet Interconnection and Congestion," September 9, 2014 (presenting evidence that "congestion can more or less instantly shift (in a day or so) from one path to another.")

strategy would affect the vast majority of edge providers.¹⁰⁷ Likewise, a strategy that sought to cut off access to an upstart edge provider that can access a broadband Internet access provider network through multiple third-party transit providers and CDNs would require a broadband Internet access provider to degrade all such access points. The idea that consumers would be willing to be cut off from (or suffer degraded access to) the vast majority of websites and other sources of Internet content simply because they could still access certain large edge providers with direct connections is completely unrealistic, unsupported, and inconsistent with the way the Internet works.¹⁰⁸

70. Dr. Evans also asserts that broadband Internet access providers could degrade or block the content of edge providers without suffering costs in the form of higher churn because customers will not switch broadband Internet access providers.¹⁰⁹ We address this argument above but summarize the key points that refute Dr. Evans' argument here. Most basically, broadband Internet access providers that significantly degrade content available through their

¹⁰⁷ See, e.g., *Evans White Paper*, p. 40 (“For medium sized or smaller BIAS providers, if they did not provide enough port capacity, a large portion of their subscribers’ content would be affected”).

¹⁰⁸ See, e.g., David S. Evans (2011), “Net Neutrality Regulation and the Evolution of the Internet Economy,” *CPI Antitrust Chronicle*, August 2011 (2): 1-9 (hereinafter *Evans (2011)*), p. 4 (discussing a “long tail” comprising “thousands of blogs and small websites that provide valuable content.”). See also *Evans (2011)*, p. 5 (“These statistics [on page views and on market caps of large edge providers and ISPs] show that ISPs are not alone in this ecosystem in being significant businesses that control access to a significant number of consumers and, further, they suggest caution in adopting net neutrality policies for the purpose of controlling ISP market power. Further consideration needs to be given to the relative bargaining power of the large players—especially given that ISPs tend to be domestic and some of the large web-content providers are global—and the extent to which the long tail is really at risk.”).

¹⁰⁹ *Evans White Paper*, p. 5 (“Large wired BIAS providers can use their control over access to households, together with other technical features involving interconnection, to impose termination fees on edge providers. They have done this by degrading the quality of the connection between the targeted edge provider and their households. They do not face penalties from lost subscribers because households have limited choices and do not necessarily know that their wired BIAS provider was degrading their service.”). See also *Evans White Paper*, pp. 4-5, 43-45.

broadband service will lose customers and/or spend large sums on save desk concessions.¹¹⁰ Moreover, switching to a broadband provider with lower speed would be an option for many customers in this context, as many consumers would surely prefer a slower broadband connection with access to all Internet content than a faster one with degraded access to popular content. Indeed, competitors, including wireless providers, would likely launch advertising campaigns and/or promotions that specifically target customers that are potentially impacted by the degraded or restricted access. In addition, even those who stay with their broadband Internet access provider would place less value on their service and thus be more likely to switch to a less profitable service (e.g., purchasing a plan with a slower connection speed). Finally, actions by fixed broadband Internet access providers that degrade their customers' experience would invite wireless providers and other potential entrants and expanders to invest more quickly in competing technologies.

E. DR. EVANS' CLAIM THAT THE NETFLIX EXPERIENCE SHOWS THAT BROADBAND INTERNET ACCESS PROVIDERS CAN HARM EDGE PROVIDERS IS INCORRECT

71. Dr. Evans points to Netflix's experience as evidence that alleged "degradation strategies" by broadband Internet access providers have facilitated large broadband Internet

¹¹⁰ Because Netflix and its agents simultaneously engaged in similar disputes with several broadband Internet access providers, one would not have expected to observe large consumer switching between broadband Internet access providers in reaction to slower Netflix speeds. (See, e.g., Dan Rayburn, "Cogent Now Admits They Slowed Down Netflix's Traffic, Creating A Fast Lane & Slow Lane," *streamingmediablog.com*, November 5, 2014, *available at* <http://blog.streamingmedia.com/2014/11/cogent-now-admits-slowed-netflixs-traffic-creating-fast-lane-slow-lane.html>. See also *McElearney Declaration*, ¶¶ 43-44; James O'Toole, "Netflix speeds lag for Verizon users amid dispute," *CNN Money*, February 21, 2014, *available at* <http://money.cnn.com/2014/02/21/technology/verizon-netflix/?iid=EL>; Katie Lobosco, "Netflix to speed up for Verizon customers," *CNN Money*, April 28, 2014, *available at* <http://money.cnn.com/2014/04/28/technology/netflix-verizon/index.html>; Victor Luckerson, "Netflix Is Paying AT&T To Make Movies Stream Faster", *Time*, July 30, 2014, *available at* <http://time.com/3059431/netflix-att-peering/>; and Jon Brodtkin, "Netflix ends one of its oldest disputes, agrees to pay Time Warner Cable," *Ars Technica*, August 19, 2014, *available at* <https://arstechnica.com/information-technology/2014/08/netflix-ends-one-of-its-oldest-disputes-agrees-to-pay-time-warner-cable/>.)

access providers' ability to negotiate interconnection fees with certain edge providers.¹¹¹ Specifically, Dr. Evans repeats Netflix's assertion that "large BIAS providers degraded the quality of its connections to their subscribers as part of a bargaining strategy to force this OVD to agree to pay access fees."¹¹² Notably, when making its arguments, Netflix was engaged in a commercial dispute about the terms of interconnection with multiple broadband Internet access providers. Dr. Israel analyzed and discussed Netflix's claims at length in the Comcast-Time Warner Cable proceeding, demonstrating that they were incorrect.¹¹³ Without repeating the specifics of the dispute, the outcome is clear. Netflix and other edge providers "won" the dispute by getting attractive direct peering contracts with broadband Internet access providers (see Section III.A).¹¹⁴

72. Moreover, this episode does not show that broadband Internet access providers can effectively degrade edge providers. Generally, in order to affect a degradation strategy, a broadband Internet access provider would have to shut down or degrade all transit paths, in the process degrading its customers' ability to reach most of the Internet content they value. Otherwise, the edge provider would simply shift away from a congested transit path to another transit path. In the case of Netflix's disputes with broadband Internet access providers, Netflix had several alternative options that were uncongested that it chose *not* to utilize.¹¹⁵ The fact that Netflix opted not to shift traffic in such a way when negotiating with broadband Internet access providers does not disprove the general point.

¹¹¹ *Evans White Paper*, pp. 45-47.

¹¹² *Evans White Paper*, pp. 45-46.

¹¹³ *Israel Comcast-TWC Reply Declaration*, § III.B.2.

¹¹⁴ See Section III.A.

¹¹⁵ *McElearney Declaration*, ¶¶ 3, 36 ("Comcast reaches well over 99 percent of the Internet's networks through more than 40 settlement-free peers and numerous other commercial interconnection agreements, and across our interconnection partners there is more than enough capacity into our network – even enough to carry all of Netflix's Comcast-bound traffic.... Netflix chose routes that it knew were insufficient, and created performance issues for itself and its customers."); *Why is Netflix Buffering? Dispelling the Congestion Myth*, Verizon Policy Blog, July 10, 2014, available at <http://publicpolicy.verizon.com/blog/entry/why-is-netflixbuffering-dispelling-the-congestion-myth>.

F. BENEFITS TO BROADBAND INTERNET ACCESS PROVIDERS FROM HARMING OVDs ARE LIKELY TO BE SMALL OR NEGATIVE

73. Dr. Evans asserts that:¹¹⁶

The FCC and DOJ also found that large cable companies have the incentives to foreclose OVDs from [reaching end users] because doing so protects their significant MVPD profits from competition from OVDs. They have found that the profits gained from the MVPD business by pursuing these strategies exceed the costs to the BIAS businesses. That is because customers face significant switching costs and seldom switch even in the face of deteriorating service.

In this section, we explain why these assertions do not withstand scrutiny, even apart from the technological and other obstacles (discussed above) to any such “foreclosure” strategy.

74. Edge providers, including OVDs, are obviously complementary to broadband Internet access providers’ broadband business.¹¹⁷ Reducing the value of these complementary products would harm broadband Internet access providers by reducing demand for their services. Some customers would switch to another broadband provider; others would stay only after receiving a concession, and some customers would likely downgrade their service (e.g., selecting a lower speed tier) and/or shift demand to another provider, such as their mobile provider. Moreover, customers who purchase a package of broadband and MVPD services might switch both services to another provider of packaged services, compounding the loss.

75. It would be particularly costly for AT&T if it attempted to degrade products that increase the value to consumers of its broadband service. AT&T is already behind cable in subscribership in relevant local markets. Degrading the service offered to edge providers, which damages the value of the complementary AT&T product, would make the gap between AT&T and cable wider, not smaller, and thus would likely be a poor business strategy.

¹¹⁶ *Evans White Paper*, p. 51.

¹¹⁷ See, e.g., Dennis W. Carlton and Bryan Keating, “An Economic Framework for Evaluating the Effects of Regulation on Investment and Innovation in Internet-Related Services,” attached to Comments of CALINNOVATES, WC Docket No. 17-708, July 16, 2017, p. 21 (“content that attracts customers to the Internet *increases* the value of” a broadband Internet access provider’s network [emphasis added]).

76. Moreover, as we discuss in more detail in the following section, consumer demand for streaming video content has exploded, and several video edge providers are well established in the marketplace. Any attempt to reverse this trend is unlikely to be successful. In fact, far from trying to foreclose OVDs, broadband Internet access providers are embracing the trend towards OVDs by embedding third-party streaming content deeper in their products (e.g., making it accessible through set-top boxes). For example, Netflix is now available on many set-top boxes that provide access to MVPD platforms.¹¹⁸ Similarly, Hulu is available to Optimum customers through set-top boxes.¹¹⁹ Comcast has made Netflix and YouTube available on its X1 set-top box and has announced that it will add Sling TV.¹²⁰ Comcast refers to this phenomenon as ISP/MVPDs serving as “aggregator[s] of aggregators.”¹²¹ Harming edge providers would reduce the content available on the overall distribution

¹¹⁸ Netflix, “Connect to Netflix using your favorite devices,” *available at* <https://devices.netflix.com/en/> (identifying at least ten set-top boxes on which Netflix is available).

¹¹⁹ Jacob Kastrenkes, “Hulu is now a channel on Optimum cable boxes,” *The Verge*, April 7, 2016, *available at* <https://www.theverge.com/2016/4/7/11386096/cablevision-optimum-launch-hulu-support-cable-boxes>.

¹²⁰ Comcast Corp., “Comcast to Launch Netflix on X1 to Customers Nationwide, Press Release,” Press Release (November 4, 2016), *available at* <http://corporate.comcast.com/news-information/news-feed/comcast-to-launch-netflix-on-x1-to-millions-of-customers-nationwide>; Comcast Corp., “Comcast to Launch YouTube on Xfinity X1,” Press Release (February 27, 2017), *available at* <http://corporate.comcast.com/news-information/news-feed/comcast-to-launch-youtube-on-xfinity-x1>; Comcast Corp., “Comcast Boosts Multicultural Programming with the Launch of Sling TV on X1,” Press Release (November 22, 2016), *available at* <http://corporate.comcast.com/news-information/news-feed/sling-tv-to-launch-on-comcast-x1-platform>; and “Comcast (CMCSA) Q4 2016 Results – Earnings Call Transcript,” January 22, 2017, *available at* <https://seekingalpha.com/article/4040405-comcast-cmcsa-q4-2016-results-earnings-call-transcript?part=single> (“we want to offer more and complementary content to make the viewing experiences as rich and easy to access as possible. So we’ll continue to seek other partners and integrate them into the overall experience”).

¹²¹ Daniel Frankel, “Comcast’s Roberts: ‘We want to become the aggregator of aggregators,’” *FierceCable*, February 28, 2017, *available at* <http://www.fiercecable.com/cable/comcast-s-roberts-we-want-to-become-aggregator-aggregators>.

platform, thus making the broadband Internet access service less attractive, as described above.

77. Economic theory explains why it makes sense for broadband Internet access service providers to accommodate rather than obstruct OVDs. That theory teaches that it is generally *not* profitable to leverage market power (to the extent it exists) in one market to foreclose competition in a closely complementary market, even when competitors produce high-quality and/or low-cost products. As Rey and Tirole explain, a firm with market power in a primary market does not want to exclude “low-cost and high-quality varieties” from the adjacent market “since their presence makes its own [primary] product more attractive to consumers.”¹²²

78. The basic logic against foreclosure of or harm to complementary products is straightforward: strong competitive OVDs add value and thus grow the overall “pie” of profits available to the OVDs and broadband Internet access providers collectively. A broadband Internet access provider is better off letting them do so and then profiting via its broadband business, rather than attempting to foreclose OVD competition and shrinking the overall pie. The simplest hypothetical case for application of this logic would be where a broadband Internet access provider would consider foreclosing OVD competition in order to enhance its own OVD business. Economics indicates that such a strategy would generally not be profitable, as the broadband Internet access provider would be better off letting the competing OVDs grow the overall pie and profiting through its established broadband service.¹²³ In contrast, actions to harm the video edge provider would decrease the available surplus and harm both broadband Internet access providers and edge providers. Said differently, economics indicates that broadband Internet access providers and edge providers will find it profitable to negotiate efficiency-enhancing agreements that make valuable content available to consumers.

79. Finally, the fact that broadband Internet access providers negotiate directly with some edge providers (or their agents) confirms the point. For those OVDs that grow the overall pie,

¹²² Patrick Rey and Jean Tirole (2007), “A Primer On Foreclosure,” in Mark Armstrong and Robert Porter (eds.), *Handbook of Industrial Organization*, Vol. 3, p. 2182.

¹²³ See generally Rey and Tirole (2007).

fundamental economic logic indicates that a broadband Internet access provider and an OVD can always find a “middle ground” that leaves them both mutually better off than they would be under a foreclosure strategy. Indeed, this is precisely how Netflix described the outcome of its interconnection negotiations in communications with Comcast.¹²⁴

G. DR. EVANS’ CLAIM THAT BROADBAND INTERNET ACCESS PROVIDERS COULD DENY EDGE PROVIDERS SUFFICIENT SCALE TO COMPETE IS UNFOUNDED

80. Dr. Evans asserts that many edge providers benefit from scale economies such that a threat by a broadband Internet access provider to deny access to certain customers would deny the edge provider sufficient scale to compete and, specifically that “[a]s a result of these scale effects, the decision by a large BIAS provider to block an edge provider from reaching its subscribers *could* ruin the edge provider’s business.”¹²⁵ However, other than stating that the agencies expressed concern about the size of the post-merger entities in reviewing the Comcast-Time Warner Cable and Charter-Time Warner Cable mergers, Dr. Evans provides no support for this concern. For the reasons described below, the notion that a broadband Internet access provider could deny edge providers sufficient scale to make them noncompetitive is implausible.

81. First, over-the-top video is an important, public part of the business strategy of several of the most powerful companies in the world including Google, Apple, Facebook, Amazon, and Sony. It is not plausible that a broadband Internet access provider could render these OTT players non-competitive by limiting their scale. In fact, several OTT platforms are

¹²⁴ *McElearney Declaration*, ¶44 (“After the agreement was reached, and implementation was underway, Netflix’s CEO Reed Hastings wrote to Comcast executives and said: ‘We found middle ground on our issues that worked well for both of us for the long term, and works great for consumers.’ He also noted that the Comcast team’s technical agility ‘is like nothing we’ve ever seen anywhere in the world’ and predicted that ‘the great performance will be the major story over the coming months.’ Later, Netflix conceded in an email to Comcast executives that ‘you [Comcast] made paid peering affordable for us.’” [emphasis added]). See also Netflix, “Comcast and Netflix Team Up to Provide Customers Excellent User Experience,” February 23, 2014 (“Comcast Corporation (Nasdaq: CMCSA, CMCSK) and Netflix, Inc. (Nasdaq: NFLX) today announced a mutually beneficial interconnection agreement...”).

¹²⁵ *Evans White Paper*, p. 42 [emphasis added].

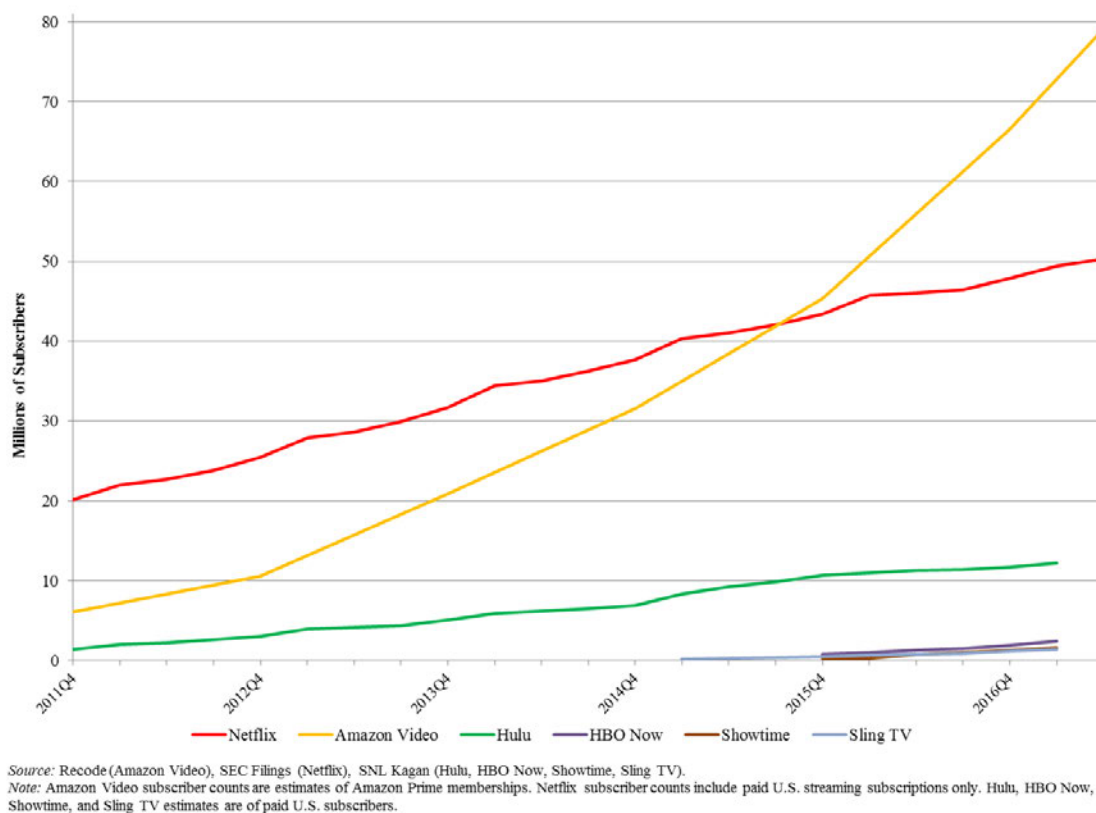
already firmly established in the marketplace. For example, Netflix has more than twice as many subscribers as Comcast, the largest broadband Internet access provider.¹²⁶ Similarly, Amazon Prime has an estimated 79.1 million subscribers (65.9 million subscribing households),¹²⁷ and Hulu had an estimated 12.2 million subscribers in Q1 2017.¹²⁸

¹²⁶ Comcast had 21.5 million residential video subscribers and 23.4 million residential internet subscribers in the second quarter of 2017, while Netflix reported 50.3 million paid streaming subscribers in the United States. Comcast Corp., “Comcast Reports 2nd Quarter 2017 Results,” July 27, 2017, *available at* <http://cmcsa.com/releasedetail.cfm?ReleaseID=1034647>; Netflix Inc., “Form 10-Q for the Period Ending 6/30/17,” July 19, 2017, *available at* <http://files.shareholder.com/downloads/NFLX/5316222798x0xS1065280-17-46/1065280/filing.pdf>, p. 20.

¹²⁷ Jason Del Rey and Rani Molla, “Amazon Prime is on pace to become more popular than cable TV,” *Recode*, July 9, 2017, *available at* <https://www.recode.net/2017/7/9/15938658/amazon-prime-numbers-members-us-households-cable-tv>.

¹²⁸ SNL Kagan, “Internet Media & OTT Market Industry Presentation, Q2 2017,” slide 14. July, 2017.

Figure 1: Popular OTT Video Providers



82. As Figure 1 demonstrates, OTT video continues to increase in popularity. Today, approximately 30 percent of traditional television viewing is via OTT platforms.¹²⁹ And approximately two thirds of broadband homes viewed videos online in 2016.¹³⁰

83. Second, following the “open field” logic that the Commission has used in other settings, the pool of broadband customers in the marketplace not associated with one of the largest broadband Internet access providers provides more than sufficient scale for an OVD to succeed even if (counterfactually) that OVD had no access to the broadband Internet access

¹²⁹ Jon Lafayette, “28% of TV Viewing Done Via Streaming,” *B&C*, July 8, 2015, available at <http://www.broadcastingcable.com/news/next-tv/28-tv-viewing-done-streaming/142380>. See also Lee Rainie, “About 6 in 10 young adults in U.S. primarily use online streaming to watch TV,” *Pew Research Center*, September 13, 2017, available at <http://www.pewresearch.org/fact-tank/2017/09/13/about-6-in-10-young-adults-in-u-s-primarily-use-online-streaming-to-watch-tv/>.

¹³⁰ SNL Kagan, “The State of Online Video Delivery,” 2016, p. 6.

provider's customers.¹³¹ In particular, even if one considers only domestic customers—obviously an overly narrow view given that OVDs are generally global—and even if one assumes that the broadband Internet access provider would “control” its customers—an incorrect view given their available alternatives and demonstrated willingness to switch—there are still plenty of other broadband customers to support an OVD, making a foreclosure theory implausible.

84. For example, using Dr. Evans' data for the sake of argument, Comcast is the largest wireline broadband Internet access provider, with its 25 million subscribers accounting for 25.4 percent of all wireline broadband subscribers in the United States.¹³² These figures imply that 74 million broadband accounts, each of which may consist of several individuals in a household, are not affiliated with the largest broadband Internet access provider. The number of potential “open-field” OVD customers would be even higher for other broadband Internet access providers that have fewer customers than Comcast. Customer levels that have proven themselves to be sufficient for viability in various analogous cases are substantially lower than 74 million accounts. For example, Netflix's 50.3 million accounts in the United States represent less than 70 percent of the number of non-Comcast fixed broadband Internet access accounts (even putting aside broadband Internet access accounts that may be mobile-

¹³¹ We do not evaluate or endorse this logic but rather investigating how it applies to the present setting. See Fourth Report & Order and Further Notice of Proposed Rulemaking, *In the Matter of The Commission's Cable Horizontal and Vertical Ownership Limits; Implementation of Section 11 of the Cable Television Consumer Protection and Competition Act of 1992; Implementation of Cable Act Reform Provisions of the Telecommunications Act of 1996; Review of the Commission's Regulations Governing Attribution of Broadcast and Cable/MDS Interests; Review of the Commission's Regulations and Policies Affecting Investment in the Broadcast Industry; Reexamination of the Commission's Cross-Interest Policy*, MM Docket No. 92-264, CS Docket No. 98-82, CS Docket No. 96-85, MM Docket No. 94-150, MM Docket No. 92-51, MM Docket No. 87-154, December 18, 2007, *available at* https://apps.fcc.gov/edocs_public/attachmatch/FCC-07-219A1.pdf. The D.C. Circuit reversed this order in *Comcast Corp. v. FCC* (2009) (Comcast Corp. v. FCC, 579 F.3d 1, 9 (D.C. Cir. 2009)).

¹³² *Evans White Paper*, Table 1.

only). Similarly, Hulu's 12.2 million accounts represent less than 17 percent of the number of non-Comcast accounts.

85. This fact becomes even more obvious when recognizing that OVDs' global operations are growing rapidly. The footprints of OVDs such as Netflix, Google, Amazon, and others are clearly global, with these markets rapidly becoming as or more important than the U.S. For example, Netflix ended the second quarter of 2017 with over 52 million international subscribers, representing just over half of its total paid subscribers.¹³³ The international addressable market for OTT video is more than 850 million broadband households, or more than seven times the number of current U.S. broadband households.¹³⁴ It is implausible that a cable provider covering a subset of the US could foreclose an OVD with large and growing global operations.

¹³³ Netflix Letter to Shareholders, 2Q17, July 17, 2017, p. 1, *available at* http://files.shareholder.com/downloads/NFLX/5324118787x0x949716/CFB029CB-65E5-43D3-A87D-998FEFAA64C0/Q2_17_Shareholder_Letter.pdf.

¹³⁴ OECD, "Fixed broadband subscriptions," Q2 2016, *available at* <https://data.oecd.org/broadband/fixed-broadband-subscriptions.htm> (showing 105 million broadband households in the United States); Point Topic, "Global Broadband Subscribers – Q4 2016," *available at* <http://point-topic.com/free-analysis/fixed-broadband-subscribers-q4-2016/> (showing 856 million broadband households globally).